REMARKS

This is in response to the official action dated March 5, 2007. Reconsideration of this patent application is respectfully requested in view of the foregoing amendments and the following remarks.

Amendments in the claims

Claim 3 was amended to reflect the amended structure of claim 19.

Claim 19 was amended to meet the objections raised in the latest Office Action. No new matter was added.

To enhance the legibility of step (a), step (a) was divided into three substeps (a1), (a2), and (a3). However, it is pointed out that no new matter was introduced into the claim. The claim wording is explicitly disclosed in the scope of the following cited paragraphs.

Step (a1) is directed to the formation of a substance library of catalytic materials. The corresponding subject-matter is disclosed on page 4, line 14-15 which reads:

"(i) preparing substance libraries of individual catalytic materials and their mixtures".

Please note that step (i) as cited is directed to forming a plurality of substance libraries, one of individual catalytic materials and one for their mixtures. In order to divide those libraries clearly, the substance library for the mixtures is

called "generation of catalysts" in the context of the specification and the claims. The preparation of the substance library of catalytic materials is described in detail on page 4, lines 26-31 which reads:

"*In the first step (i) primary components (individual materials or catalytically active phases), which have already been described or are known or have been determined empirically or intuitively for the individual reactions steps of the heterogeneous catalytic reaction under consideration, are selected and introduced into the substance library;*"

Step (a2) is then directed to the formation of the mixtures and the mixture substance library, called generation of catalysts in the scope of the specification, which is disclosed on page 4, lines 31-33 in combination with the original claims:

"*wherein by a random selection arbitrary mixtures of these individual materials are produced. In the second step (ii) these materials finally determined and prepared in this way (first generation of catalysts)…*"

Step (a3) is directed to the actual determination of the fitness (selectivity, activity) of the formed catalysts as cited above.

Furthermore, step (c) is currently amended to increase its legibility and to delete the probabilities of selection in step (c). In addition, step (c) is amended to reflect that the exchange of selected components is performed for the separate groups of components of formula (I), i.e. for the main, the

minor, the doping and the support components. This follows from the fact that the compounds have to meet formula I and that each group of components has a separate probability of selection and the examples, e.g. as disclosed on page 12, lines 31-35 and page 14, lines 20-23.

Claim 20 was deleted.

Amendments in the specification

Tables 5, 7 and 8 were amended to include O_x in the compositions.

Priority document

The German application upon which priority is claimed allegedly would fail to provide adequate support under 35 U.S.C. 112 for claims 18 and 19 of this application.

Claim 19 has been amended to overcome the rejections as outlined by the Examiner. The German priority document would contain subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention for the same reasons as this application.

It is respectfully submitted that the subject-matter of claim 19 is described in such a way as to enable one skilled in the art to which it pertains to make and/or use the invention.

The subject-matter of claim 19 corresponds to the subject-matter of claim 1 of the priority documents.

In detail, step (a) of claim 19 corresponds to step (a) of claim 1 of the priority document, amended by the subject-matter disclosed on page 4, lines 14-15 and 25 onwards.

The selection in step (b) of claim 19 for the n-th generation corresponds to step (c) for the 1st generation, (f) for the 2nd generation, (i) for the n-th generation of original claim 1.

The preparation in step (c) of claim 19 for the n-th generation corresponds to step (d), (g), and (j), respectively, of original claim 1.

The determination of the fitness in step (d) of claim 19 corresponds to step (e), (h), and (k) of original claim 1, respectively.

The performing step (e) of claim 19 corresponds to step (l) of claim 1.

No new matter has been added. The subject-matter of claims 1 and 19 is described in such a way as to enable one skilled in the art to which it pertains to make and/or use the invention, as will be discussed in the following.

It is respectfully submitted to withdraw the corresponding raised objection.

Short summary of the present invention

Since clarity objections are still raised, it is assumed that a short summary of the method steps of the present invention may be helpful.

First step (a):

preparing a substance library of catalytic materials (page 4, line 14-15, step (i)) from catalytic materials, which are known ... (page 4, line 26-32);

producing an number n_1 of arbitrary mixtures by a random selection of the materials in the substance library (page 4, line 32-33), which form the 1st generation of catalysts; the catalysts compositions obey formula (I);

determining the fitness of the produced catalysts of the 1st generation;

Second step (b):

selecting the best catalysts from the 1st generation of catalysts;

Third step (c):

preparing and producing the next generation of catalysts by (exemplarily discussed for the main component of two catalyst, but may be repeated for the minor, the doping and the support components separately):

randomly selecting a first and a second catalyst from the selected catalysts of step (b);

randomly selecting a main catalyst component of the first selected catalyst; randomly selecting a main

component of the second selected catalyst;

exchanging the selected main components of the first and the second selected catalyst, i.e. replacing the selected main component of the first catalyst in the first catalyst with the selected main component of the second catalyst and vice versa (thus: forming new catalysts mixtures);

and/or randomly varying the substance amounts of a catalyst component of at least one of the selected catalysts (thus: further forming new catalyst mixtures);

Fourth step (d):

determining the fitness of this next generation of catalysts;

Fifth step (e):

go back to the preparation of a next generation of catalysts in step (c) until the fitness does not increase any more;

In other words, the person skilled in the art selects a number of catalytic materials which are or appear to be useful. These components are randomly mixed to form a limited number of catalysts (the first generation), which obey formula I. However, it is pointed out that not all possible catalysts of formula I are formed from the chosen catalytic materials, but only a limited number (30 catalysts in example 1).

It is very important to note that the following optimization

procedure is not aimed to find the optimum catalysts of all possible catalysts which obey formula I, but rather aims to optimize the mixture composition of the selected catalysts.

The limited number of catalysts is then actually produced and their fitness is experimentally determined. The best catalyst are selected for further optimization. This optimization is based on a random modification of the components of the catalysts. One randomly selects two catalysts. Then one randomly selects a component of each of the two catalyst. This is done for each group of components A, B, D, T separate since the catalysts need to meet formula (I). These selected components are then exchanged between the two catalysts forming new catalysts. In addition, their individual substance amounts may be randomly modified to give new catalysts.

The newly generated catalysts are measured, the best are selected again and their compositions are optimized, until no new improvement of their fitness is achieved.

Disclosure Objections

Unclear probabilities W

The process step d is objected as being indefinite since it would be unclear how the probabilities W_{cat}, W_A, W_B, W_D and W_t actually relate to the determination of the composition of formula I in each nth generation (page 3, 1st paragraph, Office Action).

However, process step d does not at all address the

determination of the compositions of formula I. In contrast, step d is directed to the experimental determination of the fitness of the selected catalysts.

Since the Office Action is unclear in this respect, it is not clear how to address the raised objection. The following discussion is based on the assumption that the Office Action rather meant to address step c.

It is noted that the latest amendment "same probabilities" is withdrawn and the subject-matter of step c corresponds to the previously filed subject-matter. In addition, the probabilities have been deleted from the wording of present claim 19.

However, their use is still explained in the following. The general use of probabilities for a selection is a standard procedure. The probabilities are used to perform the random selection of catalysts from the group of catalysts and then for the random selection of a catalyst component of the selected catalyst. Such random selection always occurs with a certain probability. Usually, the probability for a selection is equal for each element. For instance, each side of a six sided dice is usually randomly selected with the same probability of $W_{dice} = 1/6$. However, if the mass is not equally distributed within the dice, one side may have a higher probability of selection W_{dice} than the other.

The probabilities W_{cat}, W_A, W_B, W_D and W_t can be equally understood. For instance, if we have three catalysts, from these

three catalysts a first and a second catalyst are randomly selected with a probability $W_{cat}=1/3$.

Now, say each catalyst has two main components and two minor components.

Then, in the next step a main component of the first selected catalyst is selected with a probability of $W_A= ½$ and a main component of the second selected catalyst is selected with a probability of $W_A= ½$. These two selected catalyst components are exchanged between the selected catalysts, i.e. the selected main component of the first selected catalyst replaces the selected main component of the second selected catalysts, vice versa. In this way, by the replacement of selected components new catalysts are formed. Optionally or additionally, the mole amounts of a selected components could be randomly modified forming a new catalyst.

This procedure may then be repeated for the minor components, the doping components and the support components. Since the catalysts of the first generation obeyed formula I and the optimization is performed group-of-componentswise, i.e. for the major, minor, doping and support components separately, the newly formed catalyst also obeys formula I. No new components are introduced, only the components, which found their way into the first generation are used during the optimization.

Applicant respectfully holds that the subject-matter of claim 19 is described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which

it is most nearly connected, to make and/or use the invention for the same reasons as this application.

If the Examiner still maintains this objection, it is respectfully submitted that the Office Action may address, which part of the above presented probability description should be further clarified in order to overcome this objection.

X-variables in tables 4 and 6

The x-variables in tables 4 and 6 have previously not been defined.

Applicant previously asserted that it would be conventional for a person skilled in the art not to define the amount of oxygen for the presented mixed oxide compositions. In order to present evidence for applicants assertion, the following documents are listed on the attached PTO Form-1449:

1. E. Balcells, F. Borgmeier, I. Grißtede, and H.-G. Lintz, Catalysis Letters Vol. 87, Nos. 3-4, April 2003: See paragraph 2.1;

2. US Patent No. 5,994,580: See table 1, column 9-10;

3. M.O. Guerrero-Perez 1, M.V. Martınez-Huerta, J.L.G. Fierro, M.A. Banares, Applied Catalysis A: General 298 (2006):

See table 1 (Sb-V-O catalysts and Sb-V-Nb-O catalysts without mentioning of oxygen content);

4. US Patent No. 6,906,221:

See column 2, line 26 onwards and claim 8 (catalysts with oxygen without mentioning the oxygen content);

5. US Patent No. 6,790,983:

See example 1, column 7;

6. Xin Zhang, Hui-lin Wan, Wei-zheng Weng, and Xiao-dong Yi, Catalysis Letters Vol. 87, Nos. 3-4, April 2003:

See abstract, paragraph 2.1, table 1, and the whole document;

7. D. Linke, D. Wolf, M. Baerns, O. Timpe, R. Schlögl, S. Zey, and U. Dingerdissen, Journal of Catalysis 205, 16-31 (2002):

See title, and whole document;

8. K. Oshihara, Y. Nakamura, M. Sakuma, W. Ueda, Catalysis Today 71 (2001), 153-159:

See abstract, paragraph 3, and table 1;

Copies of the U.S. Patents are not enclosed as per the U.S.P.T.O. guidelines.

However, the person skilled in the art will know, that the „x" in O_x results from the stoichiometry and the valency of the elements and can be calculated. For instance, the example catalysts 1/1 from table 4 is $Fe_{0.79}Ga_{0.02}Nb_{0.19}Ox$

				formula ...O_p
element	relative content	valency	oxygen need	molar fraction
Fe	0.79	3	1.19	0.44
Ga	0.02	3	0.03	0.01
Nb	0.19	5	0.48	0.18
O	x		sum=1.69	p = 0.63

The calculation follows from the supposed valency of the elements of the mixed oxide and oxide ion with a valency of two. For instance, the oxygen need for Nb is 0.19*5/2=0.48. After summation of the total oxygen need, the corresponding molar fractions are being calculated equation is normalised, i.e. the sum of all components is 1. Therefore, it follows: $Fe_{0.44}Ga_{0.01}Nb_{0.18}O_{0.63}$ wherein p=0.63.

Revised tables 5, 7 and 8 are amended above to include O_x of formula (I).

No new matter in amended step a

According to the Office Action, the specification would teach that the prepared catalysts compounds of formula (I) would be the introduced into the substance library. The Office Action does not state, which part of the application would support this view.

The Specification reads on page 4, lines 14-15: "(i) preparing substance libraries of individual materials and their mixtures". Thus, a plurality of libraries is formed, one for the individual materials, one for the mixtures. The substance library for the mixtures is called "generation of catalysts" in the

context of the specification, therefore step a addresses only the substance library for the individual materials as "the substance library".

The above cited step (i) is further explained on page 4, lines 26 onwards: "primary components (individual materials or catalytically active phases), which have already been described or are known or have been determined empirically or intuitively for the individual reactions steps of the heterogeneous catalytic reaction under consideration, are selected and introduced into the substance library; wherein by a random selection arbitrary mixtures of these individual materials are produced."

Thus, it is the individual materials, which are introduced into the substance library of the specification, which is also supported by the examples presented in the specification.

From these materials, a limited number of a first generation of catalysts consisting of arbitrary mixtures formed by a random selection is produced.

Previously amended claim 19 used the exact wording as presented on page 4 of the specification. Consequently, the view of the Examiner is respectfully rejected. By using the exact wording of the specification, no new matter could be introduced into the claims.

No undue experimentation in step a

According to the Office Action, undue experimentation would be required since one would have to test each and every embodiment of formula I, in order to determine if the resulting

component is a catalyst or not, which would mean that millions of possible compounds that result from formula I must be tested.

It is repeated that the present invention does not aim to find the best possible catalyst of formula I. Rather, the method according to the invention is directed to the optimization of the fitness of a limited number of first generation catalysts, which are chosen to *only obey* formula I. Hence, formula (I) only provides a limitation of the form of the possible catalysts of the first catalyst generation. In other words, not each and every possible embodiment of formula I needs to be tested, but only a limited number of catalyst, whose compositions are selected to *follow* formula I.

In mathematical terms: the optimization subspace is not the space spanned by formula I, but the space spanned by the components of the limited number of first generation of catalysts, which meet formula I.

The optimization is done by modifying their contents. The person skilled in the art arbitrarily chooses a number n_1 of catalysts, which are formed from the compounds in the substance library. In example 1 this number is 30, in example 2 this number is 20, i.e. very limited. However, if resources are available, up to 100.000 catalysts may be generated and tested, as known from combinatorial chemistry. The results as presented in the examples clearly show that even from such a low number of first generation catalysts, an optimization according to the invention leads to a significant improvement of the catalysts yield. It is emphasized

that this procedure is already industrially used in Europe based on a corresponding European patent. If a newly formed compound does not perform well or is not catalytic at all, it is simply discarded in the next selection of the best catalyst.

The actual optimization does not introduce any new materials. The materials used for the catalyst of the first generation determine the mathematical subspace in which an optimization is performed.

In example 1 on page 12 onwards, the first 30 catalysts are being chosen. The five best of the 30 catalysts (16,66 %) were taken to prepare the second generation composing ten catalysts. From these ten, the five best (50 %) are taken to prepare the third generation composing ten catalysts.

In example 2 on page 17 onwards, the first twenty catalysts are being chosen. From these twenty the best four are selected (20%) to prepare the ten new catalysts of the second generation. From these ten again four are selected (30 %) to form the third generation of ten catalysts. Again, four are selected to form ten new catalysts of the fourth generation.

Thus, undue experimentation is clearly not necessary. In contrast, the examples demonstrate that only a limited amount of experimental determination is necessary to find improved catalysts.

Hydrogenation catalysts

Claims 3-15, 19 and 20 are rejected because the

specification, while being enabling for producing hydrogenation catalysts allegedly does not reasonably provide enablement for producing any and all inorganic and organometallic catalysts.

The Specification shows the dehydrogenation of propane as an example. Of course, this is just one embodiment. The invention can be used for catalytic reactions in general. As pointed out above, not any and all inorganic and organometallic catalysts under formula I need to be produced for an optimization, but only a limited number.

Wording of claims 19, step a

The terms "material" and "element" would be used interchangeably. However, it is respectfully submitted that this is not the case. The "catalytic materials" constitute the "elements" of the substance library. This is the way the terms are used. It appears to be difficult to change the term "elements of the substance library" into "materials of the substance library". However, to meet the objection, claim 19 is amended accordingly. The term "element" is further used as "the element of the PTE", which is correct.

It is requested to delete the phrases "have already been described or" and "or have been determined empirically or intuitively". The first phrase is deleted accordingly. The second phrase in deleted partially to now read "or have been determined intuitively" since the scope of the present invention allows adding general "catalytic materials", which may be known only for

a different reaction or may be selected according to the intuition of the person skilled in the art.

Objection against claim 3

Claim 3 has been amended accordingly.

Objection against claim 9

The salts comply to formula I since "p" in formula I could also be zero (see claim 19).

For all of the foregoing reasons, it is respectfully submitted that the Specification, and all the claims, are now in complete compliance with all the requirements of 35 U.S.C. 112. Withdrawal of this ground of rejection is respectfully requested. Also, it is respectfully submitted that all claims are patentable over the prior art of record. Applicants submit that the present application is now in condition for allowance and passage to issuance is requested.

This will make of record a Telephone Conference on or about April 13, 2007, between Patent Examiner Koslow and the undersigned attorney. During this Conference, the possibility of

an Interview was discussed.

Respectfully submitted,
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Enclosures:

1. PTO Form-1449
2. E. Balcells, F. Borgmeier, I. Grißtede, and H.-G. Lintz, Catalysis Letters Vol. 87, Nos. 3-4, April 2003:
   See paragraph 2.1;
3. US Patent No. 5,994,580:
   See table 1, column 9-10;
4. M.O. Guerrero-Perez 1, M.V. Martınez-Huerta, J.L.G. Fierro, M.A. Banares, Applied Catalysis A: General 298 (2006):
   See table 1 (Sb-V-O catalysts and Sb-V-Nb-O catalysts without mentioning of oxygen content);
5. US Patent No. 6,906,221:
   See column 2, line 26 onwards and claim 8 (catalysts with oxygen without mentioning the oxygen content);
6. US Patent No. 6,790,983:
   See example 1, column 7;
7. Xin Zhang, Hui-lin Wan, Wei-zheng Weng, and Xiao-dong Yi, Catalysis Letters Vol. 87, Nos. 3-4, April 2003:
   See abstract, paragraph 2.1, table 1, and the whole document;
8. D. Linke, D. Wolf, M. Baerns, O. Timpe, R. Schlögl, S. Zey, and U. Dingerdissen, Journal of Catalysis 205, 16-31 (2002):
   See title, and whole document;
9. K. Oshihara, Y. Nakamura, M. Sakuma, W. Ueda, Catalysis Today 71 (2001), 153-159:
   See abstract, paragraph 3, and table 1;
10. Copy Petition Two Month Extension of Time

ERF:lgh

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on August 3, 2007.

Caitlin Mason

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